

**Assessment of nicotine dependence and its determinants among tobacco users in Davangere Taluk- A Cross-sectional study**Basanagouda K Patil<sup>1</sup>, Vijay S Patil<sup>1\*</sup>, A Nagrajachari<sup>2</sup>, D Kiran<sup>3</sup>

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**ABSTRACT**

**Introduction:** Tobacco use accounts for most of the preventable death and disability. Assessment of severity of nicotine dependence is the first step in providing tobacco cessation services. The objectives of this study were to assess nicotine dependence and its determinants, to assess severity of nicotine dependence using FTND scale (Fagerstrom test for Nicotine Dependence) and find attitude towards quitting. **Methods:** This was a community-based, Cross-sectional study of 617 tobacco users (age >10 years of age) in urban and rural areas of Davangere taluk, Karnataka. Interviews were conducted by using a structured, pre-tested questionnaire by house-to-house visits. Results are presented using percentages, Chi-square test, and multiple logistic regression analysis. **Results:** Among current users, 71.5% (95% CI 67.5% - 75%) were nicotine dependent, and 12.8% (95% CI 10.3% - 15.7%) showed harmful use. Together 'high' and 'very-high' dependents were more among males compared to females (63.5% vs 45.6%,  $X^2=107.64$ ,  $P<0.001$ ). A higher proportion of 'high' and 'very-high' dependents was seen in beedi smoking group (76%) compared to cigarette smokers (64.1%), smokeless tobacco users (51.7%) and mixed users (54.6%),  $X^2 = 41.61$ ,  $P<0.001$ ). Frequency of use ( $X^2=49.386$ ,  $P<0.001$ ) and duration of use ( $X^2=66.554$ ,  $P<0.001$ ) were significant determinants of nicotine dependence in multivariate analysis. A significant proportion of tobacco users expressed desire to quit (61.5%). **Conclusion:** Nicotine dependence is quite high in the community and a significant proportion of tobacco users are already suffering from high and very-high severity nicotine dependency. Frequency of tobacco use, and duration of use are important determinants of nicotine dependency and its severity.

**Key word:** Nicotine dependence, FTND, Tobacco, smoking, smokeless, Quit.

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**INTRODUCTION**

Tobacco use accounts for most of the preventable death and disability. According to recent estimates, nearly 5 million people die due to tobacco use every year and this figure is expected to increase to 10 million deaths per year by 2020,<sup>1</sup> with 7 million of these deaths to occur in China and India.<sup>2</sup> Annually, tobacco use is decreasing in developed countries by 0.2% and increasing in developing countries by 3.4

%, showing a contrast trend of immense concern.<sup>3</sup> In India, multiple forms of tobacco use complicate attempts to reduce its overall impact on public health.<sup>4</sup> The 'current use' prevalence of tobacco use in Global adult tobacco survey(GATS) 2016-17 was 28.6%.<sup>5</sup> The tobacco use prevalence was 44.8% among males and 6.8% among females in NFHS4.<sup>6</sup>

Tobacco use reflects a complex interplay of pharmacological, psychological and socio-economic factors. This century has seen a sluggish but remarkable shift from psychoanalytical and anthropological accounts of smoking that most smokers continue to smoke principally to obtain nicotine.<sup>7</sup> The most active tobacco ingredient that acts in the brain and produces addiction is nicotine (1-methyl-2-[3-pyridyl] pyrrolidine).<sup>8</sup> Nicotine dependence syndrome has been classified under nicotine related disorders by WHO's ICD-10 Classification of Mental and behavioural disorders due to use of tobacco: Diagnostic criteria for research.<sup>9</sup> The features of nicotine dependence are compulsive craving and difficulty to quit tobacco use.<sup>10</sup> Main psychological effects of nicotine include arousal or relaxation, improved concentration, low appetite, ECG changes, increased heart rate, increased blood pressure, cutaneous vasoconstriction, systemic venoconstriction, catecholamine release, increase in energy expenditure and increased platelet adhesiveness.<sup>11</sup> The World health organization calls for the FCTC signatories to introduce tobacco cessation services to help tobacco users.<sup>12-14</sup> Although more than 75% of the tobacco smokers express a desire to quit, actual quit rates observed have been very low (1-14%), mainly because of the strong nicotine addiction, lack of professional help, and easy availability of tobacco products.<sup>12, 15-19</sup>

Assessment of severity of nicotine dependence using Fagerstrom test for nicotine dependence (FTND)<sup>10</sup> scale is simple to use and widely applied method. The FTND scale is a convenient scale to assess the severity even in the community studies. Severity of nicotine dependence is usually assessed when a tobacco user comes to the health setting and this severity does not represent the severity of nicotine dependence prevalent in the community. Literature search revealed that there was no previous attempt made to assess the severity of nicotine dependence in the community in this region, hence, this study was undertaken. The objectives of this study were to assess nicotine dependence and its determinants, to assess severity of nicotine dependence using FTND scale, and find attitude of tobacco users towards quitting tobacco.

## METHODS

This Cross-sectional study was done in rural and urban areas of Davangere taluk, Karnataka. The sample size for this study was 617 current tobacco

users. This includes all the tobacco users obtained in our main tobacco prevalence study in the year 2008.<sup>20</sup> The main study was a community-based cross-sectional study with representative sample size of N=2008. This included household members aged 10 years and above who were residents of Davangere taluk. A multi-stage, probability proportional to size sampling was used to collect data. All the participants in the sample were informed about the purpose of the study. After obtaining the verbal consent, participants were interviewed separately using a structured, pre-tested proforma. The proforma collected information on selected socio-demographic profile. Current user was a person with history of consuming any tobacco product within 30 days preceding the survey.<sup>21</sup> Current tobacco users were asked about age at onset, frequency of consumption (Mild 1-9/ moderate 10-20/ heavy 11-20+), duration of regular use in years, and desire to quit tobacco habit.

ICD-10 nicotine dependence status (Dependent/ Harmful use/ Not dependent) was assessed. Schedule for Clinical Assessment in Neuropsychiatry (SCAN) questions were used.<sup>22</sup> Acute nicotine intoxication was excluded considering the rarity of the same. Among nicotine dependents, severity of nicotine dependence was assessed using FTND questionnaire. FTND questionnaire is used because of its high reliability and predictive validity.<sup>10</sup> FTND questionnaire includes a set of 8 questions with scores ranging from 0 to 3. A modified FTND questionnaire for smokeless tobacco users was used with 9 questions on similar pattern. Total severity of dependency score was classified into one of the dependency levels as given in the scale. Nicotine dependency level for smokers was classified as: I. (0-2) Very low; II. (3-5) Medium; III. (6-7) High; IV. (8-10) Very high. Nicotine dependency level for smokeless tobacco users was classified as: I. (2-4) Very low; II. (5-8) Medium; III. (9-12) High; IV. (13-16) Very high. The study was conducted after obtaining institutional ethical committee clearance. Descriptive data for prevalence estimates are presented as percentages with 95% confidence intervals. For bivariate analysis, Chi-square( $X^2$ ) test was applied to see the significant associations of various parameters with nicotine dependence. Multiple logistic regression analysis was performed to see the interaction effects of independent variables on nicotine dependence. For all the tests a 'P' value of <0.05 was considered for the statistical

**Table 1. Bivariate analysis of baseline characteristics with ICD10 nicotine dependence (N=617).**

Baseline characteristic	ICD10 nicotine dependence			X <sup>2</sup> , P value
	Dependent	Harmful Use	Not dependent	
Locality	n (%)	n (%)	n (%)	
Urban	246 (69.1)	53 (14.9)	57 (16.0)	X <sup>2</sup> = 3.56, P = 0.17
Rural	195 (74.7)	26 (10.0)	40 (15.3)	
<b>Gender</b>				
Male	334 (82.0)	53 (13.0)	20 (5.0)	X <sup>2</sup> =107.64, P<0.001
Female	107 (51.0)	26 (12.4)	77 (36.6)	
<b>Age-group</b>				
10 – 19 years	36 (32.7)	46 (41.8)	28 (25.5)	X <sup>2</sup> = 130.83, P <0.001
20 – 39 years	164 (74.2)	22 (10.0)	35 (15.8)	
40 + years	241 (84.3)	11 (3.9)	34 (11.8)	
<b>Tobacco type</b>				
Cigarette	78 (86.6)	6 (6.7)	6 (6.7)	X <sup>2</sup> = 46.36, P<0.001
Beedis	101 (84.9)	13 (10.9)	5 (4.2)	
Smokeless	240 (65.6)	47 (12.8)	79 (21.6)	
Mixed use	22 (52.4)	13 (31.0)	7 (16.7)	
<b>Frequency of use</b>				
Light (1-9times)	36 (22.2)	51 (31.5)	75 (46.3)	X <sup>2</sup> = 265.37, P<0.0001
Moderate (10-20 times)	116 (87.9)	10 (7.6)	6 (4.5)	
Heavy (20+times)	289 (89.5)	18 (5.6)	16 (4.9)	
<b>Duration of use</b>				
1-5 years	20 (14.4)	46 (33.1)	73 (52.5)	X <sup>2</sup> = 296.3, P<0.0001
6-10 years	193 (86.2)	21 (9.38)	10 (4.46)	
11+ years	228 (89.8)	12 (4.72)	14 (5.51)	

significance. Analysis was done using Statistical Package for Social Sciences (SPSS), version 16.

**RESULTS**

Among current users (N=617), 441 (71.5%, 95% CI 67.5% - 75%) were nicotine dependent, 79 (12.8%, 95% CI 10.3% - 15.7%) with harmful use and 97 (15.7%, 95% CI 12.9% - 18.9%) nicotine not dependent. The proportion of dependents was higher in males 334 (82%) compared to females 107 (51%) (X<sup>2</sup> = 107.64, P<0.001). About 36 (32.7%) tobacco users in 10-19 years age-group were dependent compared to 164 (74.2%) users in 20-39 years group and 241 (84.3%) in 40+ years group (X<sup>2</sup> = 130.83, P<0.001). There was strong association of nicotine dependence with frequency of tobacco use (X<sup>2</sup> = 265.37, P<0.0001) and duration of use in years (X<sup>2</sup> = 296.3, P<0.0001) (Table 1).

Among ICD-10 dependents, FTND severity was ‘very low’ in 10.4%, ‘medium’ in 29.9%, ‘high’ in

35.8% and ‘very-high’ in 23.9%. Together ‘high’ and ‘very-high’ dependents were more among males compared to females (63.5% vs 45.6%, X<sup>2</sup>=107.64, P<0.001). Together ‘high’ and ‘very-high’ dependents were more among 40+ years age-group (67.2%) compared to 10-19 years age-group (19.5%) (X<sup>2</sup>=79.18, P<0.001). A higher proportion of ‘high’ and ‘very-high’ dependents was seen in beedi smokers (76%) compared to cigarette smokers (64.1%), smokeless tobacco users (51.7%) and mixed users (54.6%), X<sup>2</sup> = 41.61, P<0.001 (Table 2). After adjusting for effects of variables gender, type of tobacco and age at onset in multivariate analysis, frequency of use (X<sup>2</sup>=49.386, P<0.001) and duration of use (X<sup>2</sup>=66.554, P<0.001) turned to be the significant determinants of nicotine dependence (Table 3).

Overall, 377 users (61.1%) expressed a desire to quit, 131(21.2%) users did not want to quit and 109 users (17.7%) did not know what to do. The proportion of

**Table 2. Bivariate analysis of baseline characteristics by FTND severity (N=441).**

Baseline characteristic	FTND severity				X <sup>2</sup> test, P value
	Very-Low n (%)	Medium n (%)	High n (%)	Very-high n (%)	
<b>Locality</b>					
Urban	26 (10.6)	71 (28.9)	86 (34.9)	63 (25.6)	
Rural	20 (10.3)	61 (31.3)	72 (36.9)	42 (21.5)	X <sup>2</sup> = 1.09, P = 0.78
<b>Gender</b>					
Male	30 (9)	92 (27.5)	133 (39.8)	79 (23.7)	
Female	16 (15.4)	40 (37.4)	25 (23.4)	26 (22.2)	X <sup>2</sup> = 11.53, P<0.05
<b>Age-group</b>					
10 – 19 years	19 (52.8)	10 (27.8)	5 (13.9)	2 (5.6)	
20-39 years	12 (7.3)	53 (32.3)	60 (36.6)	39 (23.8)	
40+ years	15 (6.2)	69 (28.6)	93 (38.6)	64 (26.6)	X <sup>2</sup> =79.18, P<0.001
<b>Tobacco type</b>					
Cigarette	6 (7.7)	22 (28.2)	32 (41.0)	18 (23.1)	
Beedi	4 (4.0)	20 (20)	32 (32.0)	45 (44.0)	
Smokeless	31 (12.9)	85 (35.4)	86 (35.8)	38 (15.9)	
Mixed	5 (22.7)	5 (22.7)	8 (36.4)	4 (18.2)	X <sup>2</sup> =41.61, P<0.001

**Table-3. Multiple logistic regression analysis for nicotine dependence (Likelihood Ratio Tests) (N=617)**

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-square (X <sup>2</sup> )	Degrees of freedom(df)	Sig.
Intercept	168.733(a)	0	0	.
Gender	158.554	3.004	1	0.134
Type of tobacco	170.774	2.041	2	0.36
Frequency of use	218.119	49.386	2	0.001
Duration of use (in years)	235.187	66.454	2	0.001
Age at onset	170.499	1.765	1	0.184

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0. (a) This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

users wanting to quit was higher among urban users, 252 (70.8%) than rural users, 125 (47.9%). The number of users not wanting to quit was higher in rural area, 71 (27.2%) compared to urban area, 60 (16.9%). Again, more users did not know whether to quit or not in rural area, 65 (24.9%) compared to urban area, 44 (12.3%) (X<sup>2</sup> = 33.93, P<0.001). A higher number of male users, 288 (70.8%) wanted to quit compared to female users, 89 (42.4%). Nearly equal proportions of male and female users said ‘don’t-know’ (17.2% & 18.6%) (X<sup>2</sup> = 66.0, P<0.001).

**DISCUSSION**

In this study 71.5% tobacco users were nicotine dependent and these require intense professional help and family and social support if they are to be treated. Because tobacco use in males is far more frequent, they tend to be more at risk of becoming nicotine dependent than females. It is also expected in a conservative society that a female does not smoke, and this environment provides little protection to women. Approximately 20% of people in USA develop nicotine dependence at some point in their

life, making it the most prevalent psychiatric disorder and 85% of current daily smokers are nicotine dependent.<sup>23</sup> A qualitative review of 13 surveys of prevalence of nicotine dependence noted that in USA and Germany, 25% of the adults had been dependent on nicotine in their lifetime, including 15% who were currently dependent. The study concluded that half of the current smokers do not meet DSM/ICD criterion.<sup>24</sup>

A higher proportion of nicotine dependents in 40+ years group (84.3%) compared to 10-19 years age-group (32.7%), is an indication that there is every possibility that a similar proportion of current users in the younger age-group will tend to become nicotine dependent as age passes. Moreover, nearly half of the younger tobacco users were diagnosed with 'Harmful use'. The fact that, nearly one-third in the younger age-group had already become nicotine dependent implies that nicotine dependence does not take much time to appear among users. The reason why smokers are more at risk of nicotine dependence than smokeless users' needs further research. More than 80% of moderate and heavy users and tobacco users with 6 or more years of tobacco use were nicotine dependent and this finding was significant on both bivariate and multivariate analysis.

On FTND scale, a higher proportion of males were 'high' and 'very-high' dependent (63.5%) compared to females (45.6%). This could be again due to the patterns, frequency and duration of regular use among males compared to the females. More beedi smokers were 'high' and 'very-high' dependent when compared to the cigarette or smokeless users, this could be because of the high nicotine content in beedis but it needs further research to confirm the same. An American study that assessed nicotine dependence among participants of 12 years and over using FTND scale, reported that 57.7% of current users met dependence criteria.<sup>25</sup> Nicotine dependence was evident even at lower levels of smoking. About 95% of smokers appear to be addicted. Once addicted, most smokers cannot give it up, even when they develop smoking related disease. Although most smokers want to give up their habit and keep on trying, only about 2% succeed in giving it up in any given year. This is a major reason why prevention of tobacco use is so important.<sup>26</sup>

It is interesting to note that nearly 61.1% expressed a desire to quit. Parwal AB et al,<sup>27</sup> noted that more than 75% of school students and 65% of college students expressed a desire to quit the tobacco habit. The

proportions of users wanting to quit increased with each older age. There is considerable social pressure on tobacco users to quit the habit. We could use this knowledge to design a strategy for helping users quit the habit. There will be a need to address the issues that are present with users not wanting to quit may be because of lack of awareness or casual attitude or psychosocial stress. Participants were interviewed in privacy to avoid false reporting about tobacco use. Generalizability of the study findings is high owing to the community-based study, representative sample and multistage house to house visits to select final units in both urban and rural areas. Recall bias is a limitation in this study especially in the case of long-term tobacco users. However, pretested and standardised questionnaires were used to minimise it.

**Conclusion:** It is evident from this study that nicotine dependence is quite high in the community and a high proportion of tobacco users are already suffering from high and very-high severity nicotine dependency. Frequency of tobacco use and duration of use are important determinants of nicotine dependency. A significant number of current users wish to quit the tobacco habit which shows that there is a need and demand for appropriate intervention. Tobacco control policy should prioritize on raising awareness and training healthcare workers on tobacco cessation services by establishing Tobacco Cessation Clinics (TCC) in all health institutions.

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